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# WORKFORCE DYN

## A COMPARATIVE PERSPECTIVE

by Murat Arik, Harika Erdemir, and John Seaton

What determines regional competitiveness in a knowledge economy? An answer to this question requires a look at the major characteristics of a knowledge economy: a skilled workforce, a knowledge infrastructure, and a strategic partnership between knowledge producers and disseminators and communities. As is clear from this description, the skill level of a region's workforce is crucial for promoting a competitive business environment and increasing economic prosperity. Global and national trends indicate that workforce skill level has been on the rise. As the national and state economies are undergoing a significant transformation in terms of changes in employment share of major sectors, the demand for a skilled workforce that can quickly adapt to a changing economic environment is also increasing.

Given the role of a skilled workforce in economic competitiveness, how competitive is Tennessee's workforce relative to its peers and the United States? This study identifies Alabama, Florida, Georgia, Kentucky, Mississippi, and North Carolina as peer states. To answer this question, we analyze four major issues: (1) broader socioeconomic dynamics, (2) population characteristics, (3) workforce characteristics, and (4) trends in employment by workforce characteristics. Primary sources of data are the American Community Survey (2005), the U.S. Census Bureau, the Bureau of Labor Statistics (BLS), and the Bureau of Economic Analyses (BEA).

### Socioeconomic Dynamics

In this section, we would like to briefly look at the socioeconomic dynamics in the peer states, which constitute a broader environment that closely interacts with workforce issues.

*Population growth and sources of growth.* As Table 1 (p. 18) presents, all peer states experienced more than two percent population growth between 2000 and 2005, while the growth was substantially higher in Florida (11.3 percent) and Georgia (10.8 percent). The lowest growth rates were recorded in Alabama (2.5 percent), Mississippi (2.7 percent), and Kentucky (3.3 percent). Compared to its peers, Tennessee was in the middle with a 4.8 percent growth rate.

Sources of population growth are as important as the growth itself. Even though Tennessee ranked in the middle, sources of population growth were healthier in Tennessee than the peer states because growth in Tennessee was fueled by all three sources: natural, net in-migration, and immigration. As for the peers, Florida's growth was due to net in-migration and immigration, whereas Mississippi's was due to natural growth offsetting the loss of population through out-migration.

*Labor force.* Labor force represents a segment of population, ages 16–64, who are either employed or looking for jobs. Ratio of labor force over total age cohort gives us labor force participation rate. As a related concept, unemployment rate is the percent of labor force unable to find work. Considering these definitions, both labor force and unemployment rates are important indicators of economic dynamics in a state. A growing labor force with a declining unemployment rate indicates that people who are willing to work can easily find employment opportunities.

Figure 1 (p. 18) shows the relationship between labor force growth and percentage changes in unemployment rate in the peer states between 2000 and 2005. The axes in Figure 1 intersect at the averages of seven states. Florida (Quadrant IV) had a competitive growth dynamic relative to other states in this period, as it had better than average labor force growth rate and change in unemployment rate. North Carolina and Georgia (Quadrant I) had better than average labor force growth, but their unemployment rate increased. Tennessee, along with Kentucky and Mississippi (Quadrant II), recorded less than average labor force growth but higher than average unemployment rate change, making them relatively less competitive than the other states.

*Per capita income.* As a commonly used measure of economic prosperity, per capita income varies considerably across peer states, ranging from $17,971 in Mississippi to $24,611 in Florida in 2005. Figure 2 shows the variation in per capita income and its growth rate from

# NAMICS IN TENNESSEE

StockDisc

**Given the role of a skilled workforce in economic competitiveness, how competitive is Tennessee's workforce relative to its peers and the United States?**

2000. In Figure 2 (p. 18), the axes intersect at the averages of seven states. Tennessee and Florida (Quadrant I) were more competitive than other states in terms of per capita income and income growth. Although Georgia and North Carolina (Quadrant IV) had slightly higher per capita income than Tennessee, their growth rates were somewhat smaller.

### Population Characteristics

*Racial diversity.* Figure 3 (p. 19) presents both percent of population by major racial groups and a combined racial diversity index. Tennessee's population was less diverse than that of peer states except Kentucky. Georgia had the most racially diverse population.[1]

*Population by age cohort and dependency ratios.* In 2005, Tennessee was yet to experience issues concerning the aging population. According to Figure 4 (p. 19), Tennessee's working age population was relatively larger than that of its peers. Florida and North Carolina had a relatively higher percentage of old (65 and over) population, whereas Georgia had the lowest.

When dealing with the population by age cohort, the most pronounced concern is the population dependency ratios, measured as the ratio of young (under 17) and old (over 65) population over working-age (ages 18–64) population. This ratio basically tells us how many individuals (old or young) are dependent on working-age individuals. Figure 5 (p. 19) shows dependency ratios in 2005. Tennessee was relatively better off than its peers, having the lowest total dependency ratio after Georgia. Florida, Mississippi, and Alabama had the highest total dependency ratios, but the sources of dependency vary: while Florida had the highest old-age dependency ratio, Mississippi had the highest young-age dependency ratio.

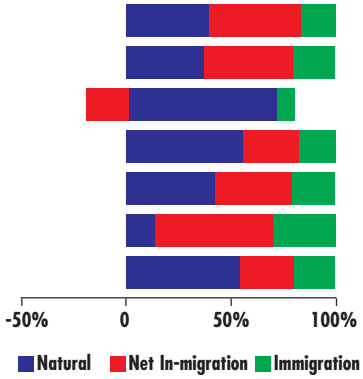
What do these dependency ratios mean? For Tennessee, each working-age individual supported 0.56 individuals, of whom 0.37 were young and 0.19 were old. In Florida, each working-age individual supported 0.66 individuals, of whom 0.39 were young and 0.28 were old.

*Educational attainment.* Human capital stock of a community in a given time is an important measure of competitiveness, but it is often hard to develop a single measure that is comparable across communities. Several measures are used for comparison purposes: educational attainment by level, average years of schooling, and literacy rate. A particular difficulty arises when comparing across several states and sectors. Average years of schooling is a single indicator and easy to use but does not tell us which educational category (i.e., associate's or bachelor's degree) contributes most to the average number of years of schooling.[2] It must be supplemented by additional information to show the contribution of specific educational categories to the average number of years of schooling.

Figure 6 (p. 20) presents both average number of years of schooling by states and percent of population 25 and over with a bachelor's

*continued on page 18*

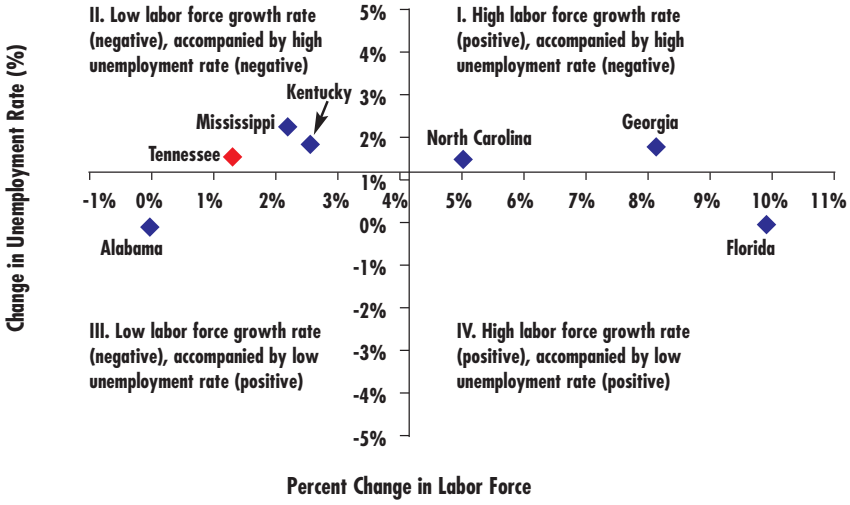
## Table 1. Population Dynamics in Peer States




| | Population (millions) 2000 | 2005 | Population Growth |
|---|---|---|---|
| Tennessee | 5.7 | 6.0 | 4.8% |
| North Carolina | 8.0 | 8.7 | 7.9% |
| Mississippi | 2.8 | 2.9 | 2.7% |
| Kentucky | 4.0 | 4.2 | 3.3% |
| Georgia | 8.2 | 9.1 | 10.8% |
| Florida | 16.0 | 17.8 | 11.3% |
| Alabama | 4.4 | 4.6 | 2.5% |

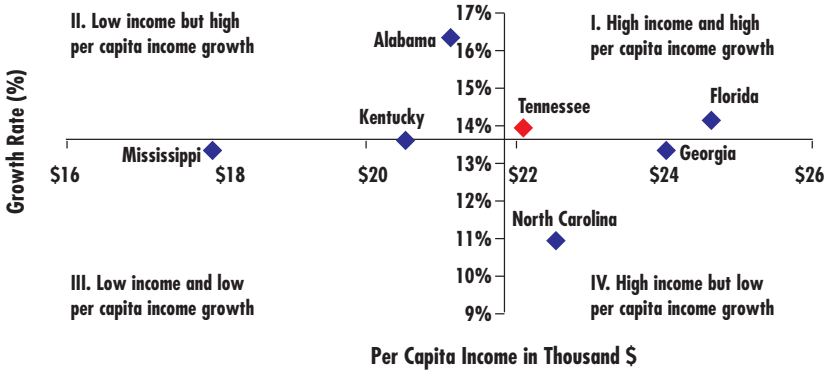
## Figure 1. Labor Force Dynamics

**Compared with the peer states labor force dynamics in Tennessee are not favorable.**




## Figure 2. Per Capita Income and Growth Rate

**Tennessee's per capita income and growth rate are close to the averages of seven states.**




*continued from page 17*

degree in 2005. The graphs are strikingly similar, but the one on the left clearly separates states into three groups: highly competitive (Florida, Georgia, and North Carolina) followed by Alabama and Tennessee in the middle and then the less competitive states (Kentucky and Mississippi). Overall, the skill makeup of Tennessee's population is less competitive than that of many peer states. We must emphasize that stock of human capital here applies to *all* population 25 and over. In the next section, we restrict the universe of population to the workforce ages 25–64 to analyze skill issues from a comparative perspective.

*Language problem.* Some states may experience problems regarding the population's ability to speak English. The presence of a large number of people with a language problem may require special programs to address this issue. According to Figure 7 (p. 20), Tennessee had the lowest percent of population after Mississippi who speak English less than very well in 2005. Florida, Georgia, and North Carolina had the highest percent of population who speak English less than very well. However, as previous sections suggest, these states have better growth performance than other peer states, suggesting language ability is not an immediate community problem negatively affecting growth dynamics.

### Workforce Dynamics

Many studies in the past decade analyzed the role of human capital in economic development and competitiveness of regions. A consensus emerged from both empirical and theoretical studies that human capital matters for economic development. At the heart of this debate lies the skill level of the workforce in a given region. This and the next section specifically deal with the characteristics of the workforce in Tennessee from a comparative perspective. The concept of workforce here is defined as workers 25–64 with a paying job working at least one hour a week. The data set for this section is primarily the filtered data from the 5 percent PUMS (Public Use Microdata System) files of the American Community Survey (2005) for the peer states and the U.S.

*Workforce skill composition.* How does Tennessee's workforce compare with the peer states and the U.S. in terms of skill composition? We use three skill levels: low, medium, and high.[3]

Figure 8 (p. 20) presents the skill composition of Tennessee's workforce from a comparative perspective. The graphs are quite revealing: Tennessee has the lowest percentage of work-

force with medium skill and the highest percentage of workforce with low skill relative to the peer states and the U.S. Florida and Mississippi have the highest percent of workforce at the medium skill level. However, Florida diverges from Mississippi in an important way: while Florida has one of the highest percentages of workforce with a high skill level, Mississippi has the lowest.

Tennessee's poor competitive position in terms of medium and high skill levels is further reinforced with the findings in a recent study, which provide a comprehensive assessment of workforce skill development across states and countries.[4] Even though skill composition based on years of schooling is important and measures are readily available, a critical aspect of a knowledge economy is the ongoing preparation of the workforce to adapt to the changing economic environment.

According to Wagner (2006), Tennessee is critically behind the peer states in terms of preparing its workforce: only 2.6 percent of its workforce enrolled part-time in any type of postsecondary institution, ranking second lowest after Mississippi (2.4 percent). Among the peers, 3.7 percent of Florida's and North Carolina's workforce are updating their skills, followed by Kentucky (3.6 percent), Alabama (3.5 percent), and Georgia (2.9 percent).

*Workforce by gender and skill.* Two general observations about Figure 9 (p. 21) clearly stand out across all states and the U.S. First, the percentage difference between males and females at the medium skill level is negative, indicating that relatively more of the female workforce is acquiring education at the medium skill level. Second, the percentage difference between males and females at the low skill level is positive across all states, indicating that relatively more of the male workforce has a low skill level than the female workforce. While the gaps at the medium and low skill levels are large in the U.S., North Carolina, and Mississippi, they are somewhat smaller in Georgia, Alabama, and Florida. Tennessee and Kentucky are in the middle of these two extreme groups. In terms of gender skill gaps at the high skill level, however, there are significant variations across the states: the gap is in favor of females in the U.S., North Carolina, Mississippi, and Kentucky but in favor of males in Florida. The gap is negligible in Tennessee, Alabama, and Georgia, running -/+0.5 percentage points.

*Workforce skill composition by major sectors.* The skill makeup of major sectors is different:

*continued on page 20*

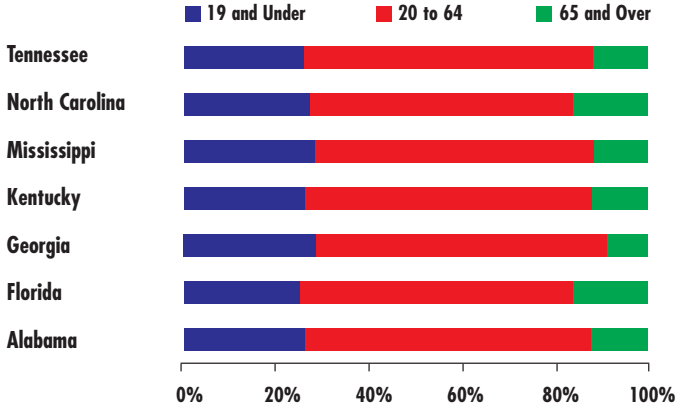
## Figure 3. Racial Composition of Population and Diversity Index

**Population composition of states by race**

**Tennessee is less diverse than peer states.**

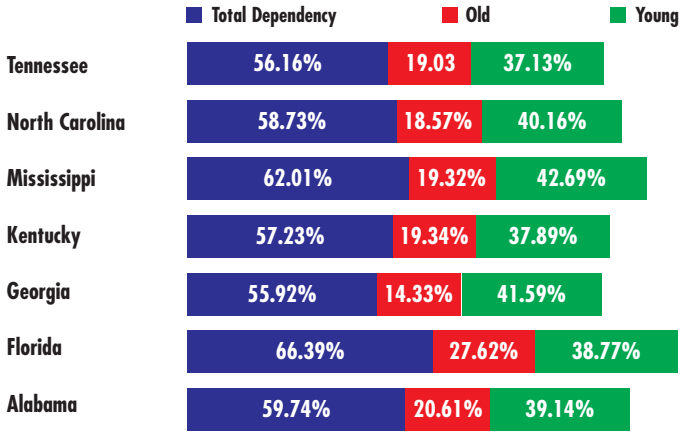

## Figure 4. Population by Age

**Aging population is less a concern for Tennessee than for other peer states.**

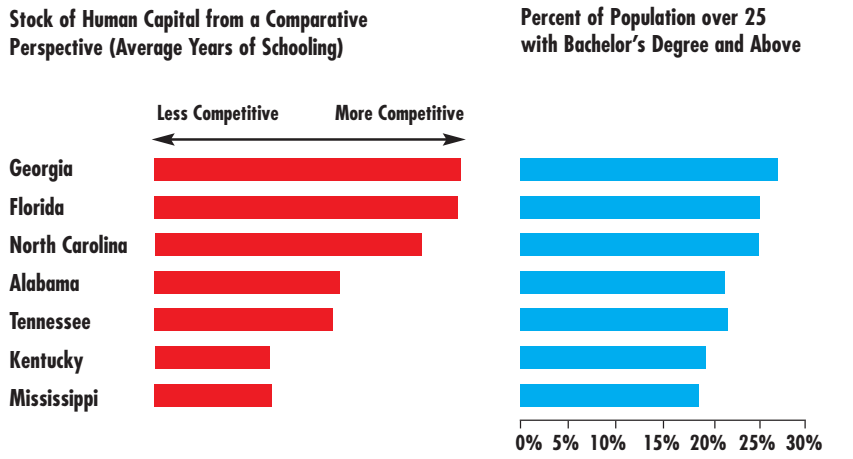



## Figure 5. Dependency Rates 2005

**Tennessee has the second lowest dependency rates among the peer states.**

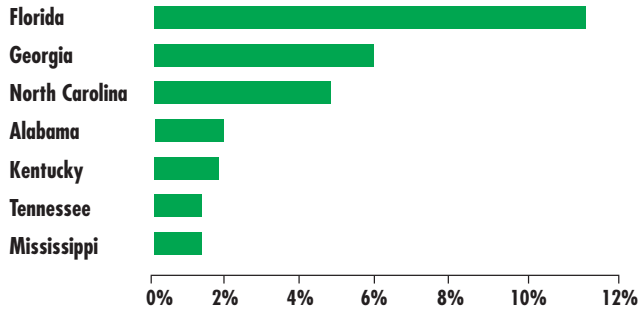


## Figure 6. Educational Attainment of Population over 25



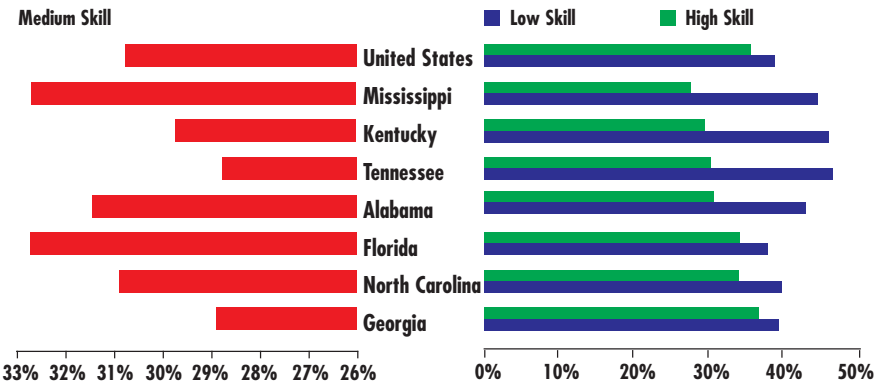

## Figure 7. Is Language a Problem?

**Florida, Georgia, and North Carolina have the highest proportional population who speak English less than very well.**




## Figure 8. Workforce Skill Composition

**Tennessee has the lowest percentage of workforce at the medium skill level and the highest percentage of workforce at the low skill level.**




Source: American Community Survey (2005) for the workforce ages 25–64

*continued from page 19*

some sectors heavily rely on a medium-skill workforce, while others rely on a high-skill workforce. A survey of literature indicates the demand in major industries for workers with higher skill is increasing.[5] As the skill makeup of industries differs, so does the industry structure of each state relative to other states or the U.S. Before analyzing the skill composition of each major industry by state, we highlight differences of industry makeup across peer states.

As Figure 10 (p. 21) indicates, among the peer states, industry structures in Tennessee, Mississippi, and Florida are less similar to the U.S. economy, but this does not imply any similarity between Tennessee's and Florida's economies Of the peer states, North Carolina's economy is most similar to the U.S. economy.[6]

In terms of the skill composition of the workforce by industry, we highlighted two major skill levels: medium (Table 2, p. 21) and high (Table 3, p. 22). Each level by industry and state is than ranked by a given industry's skill level in the U.S. These two tables should be considered together. According to Tables 2 and 3, only a few industries have medium and high skill levels larger than the U.S. Overall, Tennessee is the second less competitive after Kentucky in terms of relative medium- and high-skill share of the workforce by major industries. North Carolina and Florida are relatively more competitive than the peer states and the U.S. Although Georgia has few sectors that are relatively competitive at the medium skill level, the high skill composition of its workforce across major industries is extremely competitive.

The medium skill composition of Mississippi's workforce is very competitive compared to the peer states, but none of Mississippi's major sectors have a high skill content larger than the U.S. average. Alabama is performing somewhat better than Tennessee in terms of the medium and high skill sets of its major industries, but Alabama's workforce is less competitive than many peer states and the U.S.

### Trend in Workforce Skills

How can we measure the trend in workforce skill composition by industry and state using the American Community Survey (2005)? We first calculated workforce skill composition by age cohort: young (25–34) and old (55–54). The age difference between the two cohorts is about 25 years. Assuming the skill composition of each cohort remains the same as when its members were first hired, the percentage difference between the skill composition of the young and old workforce reflects the trend in workforce skill composition.

*Intergenerational shift.* Table 4 (p. 22) presents intergenerational shift in skill composition by states. A clear general trend is that, regardless of the initial level of skill composition of states by age cohort, the share of new recruits with low skill tends to shrink across states. In all states, the percent of new recruits with medium skill is increasing considerably, as the percentage difference between young and old medium-skilled workforce demonstrates. At the medium skill level, the largest percentage shift took place in Mississippi (6.4 points) and Kentucky (6.3 points).

Overall, the skill trend in Tennessee shows an impressive movement from low to high, as the intergenerational skill difference by level indicates: the low skill shift was -8.44 percent, medium 5.55 percent, and high 2.89 percent. While the trend is promising, when we look at the overall initial skill composition by age cohort and percentage difference between young and old, Tennessee's performance becomes an average of peers at best.

*Intergenerational skill shift by industry.* It is not easy to show intergenerational differences by skill level and industry in one table. No single indicator of stock of educational attainment would capture the trend in skill composition of major industries across peer states. Tables 5 (p. 22) and 6 (p. 23) present two aspects of the trend in stock of educational attainment by industry.

Table 5 indicates the total intergenerational shift in skill composition (low, medium, and high) of each industry. Since absolute values are used, the index value changes from 0 to 200, 0 indicating no difference between the skill composition of the young and old workforce for a given industry.[7] In other words, the higher the index value, the larger the shift in the skill composition of the industry workforce over the years. This index, however, does not tell us which skill category (low, medium, or high) is in high or low demand. Table 5 ranks data by intergenerational shift by industry in the U.S.

The largest intergenerational skill shifts by industry in the U.S. took place in arts, entertainment, and recreation; healthcare; finance, insurance, and real estate; information and communications; and educational, health, and social services. A look at industries by peer states clearly highlights that an intergenerational skill shift has occurred across industries by states. The major sector that recorded the highest intergenerational skill shift is educational, health, and social services. There are, however, significant variations by industry across states. For

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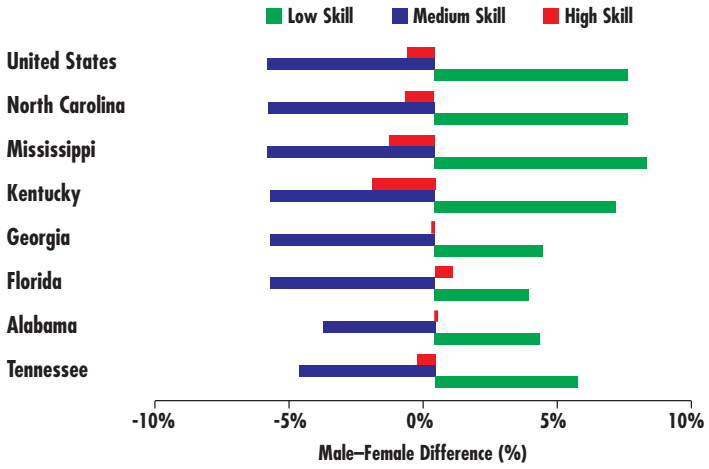
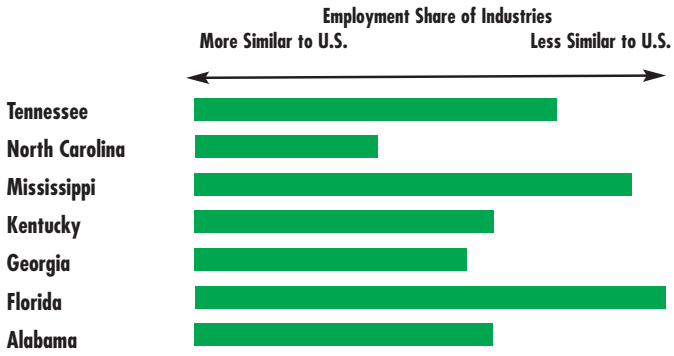
## Figure 9. Male–Female Gender Gaps in % Difference by Skill Level




## Figure 10. Industry Structure

**Tennessee's industry structure is less similar to the U.S. industry structure compared to peer states.**




## Table 2. Medium Skill Level of Workforce by Industry

**Green indicates that the medium skill level for a certain industry is greater than the U.S. average.**

| | AL | FL | GA | KY | MS | NC | TN | U.S. |
|---|---|---|---|---|---|---|---|---|
| Educational, Health, Social Services | 16.66% | 17.19% | 15.11% | 15.71% | 17.40% | 18.80% | 14.82% | 17.36% |
| Manufacturing Apparel | 23.83% | 27.13% | 19.91% | 19.72% | 26.73% | 22.69% | 21.76% | 23.98% |
| Professional, Scientific, Management | 30.33% | 32.39% | 26.20% | 30.86% | 31.74% | 28.79% | 31.06% | 28.14% |
| Construction | 25.23% | 27.33% | 23.94% | 25.02% | 25.25% | 25.10% | 21.75% | 28.38% |
| Manufacturing Chemical | 28.88% | 28.49% | 26.20% | 30.14% | 33.43% | 27.18% | 25.81% | 29.18% |
| Arts, Entertainment, Recreation, Accommodations | 29.61% | 32.80% | 28.23% | 29.73% | 30.68% | 30.94% | 27.54% | 29.93% |
| Manufacturing Machinery | 31.03% | 31.67% | 25.53% | 29.24% | 28.29% | 28.81% | 24.95% | 29.93% |
| Wholesale Trade | 38.22% | 32.84% | 30.80% | 31.38% | 33.97% | 33.20% | 32.33% | 32.03% |
| Retail Trade | 32.82% | 35.06% | 31.79% | 29.21% | 36.09% | 34.33% | 31.39% | 33.70% |
| Information and Communications | 40.92% | 37.81% | 32.58% | 30.30% | 39.49% | 36.11% | 34.66% | 33.82% |
| Finance, Insurance, Real Estate | 39.44% | 38.40% | 33.02% | 34.48% | 44.40% | 34.92% | 35.43% | 34.77% |
| Transportation and Warehousing | 32.19% | 37.79% | 34.65% | 32.97% | 35.09% | 32.32% | 32.43% | 35.85% |
| Public Administration | 34.63% | 39.87% | 38.77% | 35.93% | 42.20% | 38.75% | 35.41% | 37.95% |
| Healthcare | 43.13% | 38.68% | 38.09% | 42.03% | 44.66% | 41.07% | 36.93% | 38.49% |
| Utilities | 34.70% | 33.81% | 31.26% | 31.28% | 30.23% | 34.32% | 29.84% | 38.76% |

Increasing Medium Skill Makeup

Source: American Community Survey 2005

## Table 3. High Skill Level of Workforce by Industry

**Green indicates that the high skill level for a certain industry is greater than the U.S. average.**

| | AL | FL | GA | KY | MS | NC | TN | U.S. |
|---|---|---|---|---|---|---|---|---|
| Construction | 11.31% | 12.29% | 14.27% | 8.08% | 8.19% | 12.74% | 8.83% | 11.73% |
| Manufacturing Apparel | 7.05% | 15.55% | 15.79% | 13.26% | 9.18% | 12.78% | 12.05% | 14.77% |
| Transportation and Warehousing | 12.16% | 18.67% | 21.71% | 15.46% | 12.37% | 15.48% | 18.65% | 16.08% |
| Arts, Entertainment, Recreation | 14.44% | 19.35% | 19.76% | 16.59% | 12.68% | 19.86% | 16.93% | 19.41% |
| Retail Trade | 17.86% | 20.03% | 22.66% | 17.04% | 16.37% | 19.47% | 17.62% | 20.32% |
| Manufacturing Chemical | 18.80% | 24.11% | 23.28% | 15.07% | 16.57% | 24.11% | 18.20% | 22.05% |
| Utilities | 28.08% | 28.89% | 24.34% | 23.46% | 18.60% | 27.88% | 27.21% | 25.22% |
| Wholesale Trade | 19.41% | 29.06% | 31.54% | 20.97% | 19.73% | 27.92% | 24.02% | 27.05% |
| Manufacturing Machinery | 21.06% | 31.93% | 28.35% | 17.39% | 11.47% | 21.65% | 14.06% | 27.41% |
| Healthcare | 31.59% | 36.72% | 36.32% | 32.32% | 29.59% | 34.08% | 36.16% | 36.30% |
| Public Administration | 41.48% | 39.34% | 35.76% | 35.02% | 29.76% | 37.70% | 34.91% | 39.53% |
| Finance, Insurance, Real Estate | 34.21% | 35.69% | 42.07% | 35.20% | 31.27% | 45.22% | 35.50% | 41.36% |
| Information and Communications | 34.15% | 37.97% | 48.65% | 35.15% | 33.85% | 42.80% | 36.53% | 44.42% |
| Professional, Scientific, Management | 40.37% | 41.04% | 50.71% | 38.97% | 37.59% | 46.27% | 37.99% | 47.12% |
| Educational, Health, Social Services | 66.06% | 66.81% | 67.36% | 63.72% | 65.53% | 65.02% | 66.36% | 67.09% |

Increasing High Skill Makeup ↓

Source: American Community Survey 2005

## Table 4. Intergenerational Difference in Workforce Skill Composition

**(Ages 25–34 and 55–64), Ranked by Gains in Medium Skill**

| | Young (25-34) | | | Old (55-64) | | | Difference (Young-Old) | | |
|---|---|---|---|---|---|---|---|---|---|
| State | Low | Medium | High | Low | Medium | High | Low | Medium | High |
| Florida | 34.47% | 33.07% | 32.46% | 35.33% | 31.67% | 33.00% | -0.86% | 1.40% | -0.54% |
| Georgia | 33.20% | 28.87% | 37.93% | 40.62% | 27.29% | 32.09% | -7.43% | 1.59% | 5.84% |
| North Carolina | 34.18% | 31.28% | 34.55% | 41.11% | 29.30% | 29.59% | -6.94% | 1.98% | 4.96% |
| Alabama | 37.18% | 33.68% | 29.14% | 42.95% | 29.51% | 27.54% | -5.77% | 4.18% | 1.59% |
| Tennessee | 37.98% | 30.69% | 31.33% | 46.42% | 25.14% | 28.45% | -8.44% | 5.55% | 2.89% |
| Kentucky | 37.43% | 33.08% | 29.49% | 45.50% | 26.80% | 27.70% | -8.06% | 6.27% | 1.79% |
| Mississippi | 37.02% | 35.20% | 27.78% | 44.08% | 28.84% | 27.08% | -7.06% | 6.36% | 0.70% |
| United States | 33.20% | 31.27% | 35.53% | 37.48% | 29.23% | 33.29% | -4.27% | 2.04% | 2.24% |

Source: American Community Survey 2005. Note: Low = less than high school and high school; medium = some college and associate's degree; high = bachelor's and above.

## Table 5. Intergenerational Skill Shifts: Young to Old Workforce

**Ranked by shifts in the U.S.: Shift between young (25–34) and old (55–64) workforce**

| | TN | AL | GA | KY | MS | NC | FL | U.S. |
|---|---|---|---|---|---|---|---|---|
| Transportation and Warehousing | 21.82 | 17.54 | 12.16 | 20.82 | 12.11 | 27.51 | 6.76 | 4.68 |
| Utilities | 21.90 | 12.17 | 39.64 | 50.57 | 60.61 | 23.30 | 10.69 | 6.53 |
| Manufacturing Apparel | 20.88 | 6.93 | 11.40 | 21.53 | 20.81 | 11.76 | 9.93 | 8.17 |
| Wholesale Trade | 14.14 | 6.64 | 12.76 | 35.09 | 24.22 | 11.64 | 5.19 | 8.55 |
| Professional, Scientific, Management | 9.93 | 11.02 | 19.58 | 12.70 | 10.70 | 26.23 | 3.41 | 9.68 |
| Manufacturing Chemical | 21.25 | 25.55 | 15.50 | 12.83 | 13.77 | 17.58 | 8.16 | 9.80 |
| Manufacturing Machinery | 18.18 | 7.24 | 19.49 | 30.25 | 13.97 | 29.11 | 13.57 | 12.10 |
| Construction | 21.52 | 10.61 | 22.67 | 7.99 | 13.16 | 9.75 | 28.91 | 14.18 |
| Retail Trade | 26.65 | 19.95 | 9.98 | 27.89 | 21.87 | 25.21 | 4.31 | 14.43 |
| Arts, Entertainment, Recreation | 17.73 | 24.20 | 21.40 | 31.28 | 26.22 | 8.22 | 15.66 | 14.57 |
| Healthcare | 36.64 | 7.04 | 29.47 | 34.32 | 29.06 | 24.91 | 13.45 | 20.71 |
| Finance, Insurance, Real Estate | 22.70 | 36.99 | 22.37 | 42.27 | 30.26 | 33.11 | 13.02 | 22.19 |
| Information and Communications | 44.40 | 7.25 | 46.62 | 15.60 | 28.75 | 33.57 | 22.18 | 25.19 |
| Educational, Health, and Social | 27.92 | 33.78 | 37.87 | 22.24 | 29.93 | 37.99 | 17.43 | 25.27 |

From Small to Large Shifts in Skill Makeup ↓

Source: American Community Survey 2005 and BERC

*continued from page 21*

example, three major industries that experienced the largest intergenerational skill shifts (from highest to lowest) were information and communications, healthcare, and educational, health and social services in Tennessee. Overall, the largest shifts in skill composition by industry took place in Kentucky and Mississippi, followed by Tennessee. Florida's major sectors experienced the lowest intergenerational shifts in the skill composition of the workforce.

The intergenerational skill shift index tells us the extent of intergenerational skill transformation by industry but does not show us which skill sets are in demand or declining. Table 6 provides additional information on the direction of skill shifts by skill category and major industry. Shifts in low skill by industry are excluded from the table, as the sum of percentage shifts for medium and high skills equals the shifts in low skill.

As Table 6 clearly indicates, intergenerational shifts in skill categories by major industry reflect the economic structure in each state. Three major sectors that recorded the largest intergenerational shifts in high skill by major industry are educational, health, and social services; information and communications services; and finance, insurance, and real estate in the U.S. As Figure 10 indicates, the North Carolina and Florida economies are more similar to the U.S. economy than other peer economies. Similarly, the same major sectors in North Carolina and Florida recorded the largest intergenerational shifts in the high skill category.

When the intergenerational shift in high workforce skill is compared across peers, the following general observations emerge: almost all sectors except construction experienced shifts toward high skill across the peer states. Five major sectors experienced the highest intergenerational shift toward high skill across the states: finance, insurance, and real estate; education, health, and social services; information and communications; healthcare; and utilities.

Similarly, many peer states recorded an intergenerational shift toward medium skill. However, as Table 6 makes clear, not all peer states experienced similar shifts. For example, patterns of intergenerational shift in medium skill follow a similar pattern in the U.S., Florida, North Carolina, and Georgia, while a similar pattern emerges among Mississippi, Alabama, and Tennessee. To draw a general conclusion regarding intergenerational shifts in medium skill, not all sectors across the states recorded gains; the share of the workforce with medium skill in certain industries declined over the years based on cohort data. The largest gains

across industries and states took place in arts, entertainment, and recreation; healthcare; retail trade; information and communications; manufacturing (chemical); and utilities.

In Tennessee, only two of the 14 major sectors recorded an intergenerational shift from medium and high to low skill (construction and utilities). Tennessee's 12 major industries experienced intergenerational skill shifts at varying degrees from low to medium or high. The top three major industries experiencing intergenerational skill shifts from low to medium or high are information and communications; healthcare; and education, health, and social services.

Compared with its peer states, Tennessee's experience with intergenerational skill shifts from low to medium and high was somewhat competitive, placing it second after Kentucky but on par with Georgia. These results should be interpreted thus: a greater percentage of new recruits in Tennessee is required to have medium and high skill compared to the aging workforce.

## Conclusion and Policy Implications

Although Tennessee's population dynamics are more or less competitive, certain characteristics of its population and labor force—such as educational attainment—put it in a less competitive position than its peer states. A more detailed look shows its workforce skill composition is also somewhat less competitive than that of its peer states.

Tennessee's trend indicates a relatively larger major skill shift from low to medium and high than its peer states. Taking into account the level of skill across age cohorts, this indicates a major catch-up effort with its peers, which have a competitive workforce skill composition.

Several issues deserve attention. Tennessee workforce and employers should be more receptive to the concept of lifelong learning and skill upgrading. To increase the number of employees and employers in skill-retraining programs may require attitudinal changes. The nature of the workforce skill question in economic development circles is also shifting from how much educational stock a region has to how good a region's educational stock is. This has important policy implications for policymakers, employers, employees, and training institutions alike. ■

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## Notes

1. The racial diversity index, or Rae Index, is calculated using the following formula, borrowed from political science literature to measure political fragmentation: Diversity index = $1 - \sum(f)^2$, where ($f$) represents the fraction of ($i$th) racial group in a population. The higher the index value, the more diverse the community is.

2. For a comprehensive discussion of measurement issues regarding human capital stock, see OECD, Center for Educational Research and Innovation, *Human Capital Investment: An International Comparison* (Organization for Economic Cooperation and Development, 1999). Average years of schooling in this section are calculated using average number of years for each educational attainment category (i.e., less than high school, high school, associate's degree).

3. This designation of skill levels is somewhat arbitrarily constructed using years of schooling completed. This categorization of educational attainment does not take into account experience, on-the-job training, or quality of formal training. Low skill = any schooling at high school level and below; medium skill = any schooling higher than high school but below bachelor's degree; and high school = bachelor's degree and above.

4. For a comprehensive treatment of skill development across states and countries, see Alan Wagner, *Measuring Up Internationally: Developing Skills and Knowledge for the Global Knowledge Economy* (National Center for Public Policy and Higher Education, 2006).

5. For articles dealing with various issues regarding industry skill shifts, see Bureau of Labor Statistics (www.bls.gov), *Monthly Labor Digest*.

6. A simple but useful formula, the Krugman Regional Specialization Index, is used to calculate structural similarities between two types of economies and intergenerational shifts in skill makeup of each industry within the peer states. Structural similarity or shift index = $\sum |e_{i,TN} - e_{i,TN}|$, where ($e_{i,TN}$) = percent of employment of ($i$th) industry in Tennessee, and ($e_{i,US}$) = percent of employment of ($i$th) industry in the U.S.

7. See note 6.

**Although Tennessee's population dynamics are more or less competitive, certain characteristics of its population and labor force—such as educational attainment—put it in a less competitive position than its peer states.**

## Table 6. Intergenerational Skill Shifts Ranked by High Skill Shift in the U.S.

**Intergenerational skill gaps between young (25–34) and old (55–64) workforce (percentage difference)**

| | TN | | AL | | GA | | KY | | MS | | NC | | FL | | U.S. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Med | High | Med | High | Med | High | Med | High | Med | High | Med | High | Med | High | Med | High |
| Construction | -3.5% | -7.3% | 1.0% | -5.3% | -4.8% | -6.6% | -2.1% | -1.9% | 5.9% | -6.6% | -1.8% | -3.1% | -7.6% | -6.8% | -1.9% | -5.2% |
| Transportation and Warehousing | 5.5% | 5.4% | 5.6% | -8.8% | -1.5% | 6.1% | 6.2% | 4.2% | -5.4% | 6.1% | 13.8% | -3.8% | -3.4% | 1.3% | 2.1% | 0.3% |
| Arts, Entertainment, Recreation | 8.8% | 0.1% | 12.1% | -4.2% | 6.8% | 3.9% | 15.6% | -4.2% | 13.1% | -10.7% | 3.6% | 0.5% | 5.8% | 2.1% | 6.6% | 0.7% |
| Retail Trade | 9.6% | 3.8% | 9.4% | 0.6% | 3.2% | 1.8% | 12.4% | 1.5% | 10.9% | -8.6% | 7.8% | 4.8% | 0.5% | 1.7% | 5.2% | 2.0% |
| Manufacturing Apparel | 4.4% | 6.0% | -0.3% | 3.5% | 3.1% | 2.6% | 9.5% | 1.3% | -5.4% | -5.0% | 3.2% | 2.7% | 5.0% | -0.2% | 1.5% | 2.6% |
| Utilities | -11.0% | 5.0% | -5.9% | -0.1% | -11.2% | 19.8% | 23.5% | 1.8% | 17.2% | 13.1% | -6.3% | 11.7% | -5.3% | 1.5% | -0.2% | 3.3% |
| Healthcare | 8.8% | 9.6% | 0.9% | 2.6% | 7.6% | 7.1% | 11.2% | 6.0% | 0.2% | 14.4% | 9.9% | 2.5% | 5.8% | 1.0% | 6.4% | 3.9% |
| Manufacturing Chemical | 10.6% | -3.0% | 12.8% | -3.4% | 1.8% | 6.0% | -4.4% | 6.4% | 6.8% | -6.9% | -0.1% | 8.8% | -1.1% | -3.0% | 1.0% | 3.9% |
| Wholesale Trade | -1.3% | 7.1% | -2.5% | 3.3% | -1.8% | 6.4% | 4.9% | 12.7% | 2.6% | 9.5% | -4.6% | 5.8% | -2.0% | 2.6% | -2.0% | 4.3% |
| Professional, Scientific, Management | 3.7% | 1.3% | 0.1% | 5.4% | -2.8% | 9.8% | -6.3% | 4.6% | 5.3% | -1.1% | -10.9% | 13.1% | -1.3% | 1.7% | -2.8% | 4.8% |
| Manufacturing Machinery | 4.8% | 4.3% | 3.4% | 0.2% | 1.1% | 8.7% | 6.0% | 9.1% | 2.3% | 4.7% | 9.1% | 5.4% | 3.3% | 3.4% | -0.1% | 6.0% |
| Finance, Insurance, Real Estate | -5.9% | 11.3% | -4.6% | 18.5% | 0.3% | 10.9% | -4.0% | 21.1% | 5.2% | 9.9% | -9.2% | 16.6% | 0.3% | 6.3% | -1.5% | 11.1% |
| Information and Communications | 14.3% | 7.9% | -3.6% | 2.2% | -7.4% | 23.3% | 7.8% | -4.7% | 12.8% | 1.6% | -0.1% | 16.8% | -5.9% | 11.1% | -2.3% | 12.6% |
| Educational, Health, and Social | 2.6% | 11.4% | -2.2% | 16.9% | -1.1% | 18.9% | 2.9% | 8.2% | 5.3% | 9.6% | -4.9% | 19.0% | 1.9% | 6.8% | -1.8% | 12.6% |

Source: American Community Survey (2005) and BERC